

11. Report on the Deaths which occurred in the Zoological Gardens during 1914, together with a List of the Blood-Parasites found during the Year. By H. G. PLIMMER, F.R.S., F.Z.S., Pathologist to the Society.

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On January 1st, 1914, there were 733 mammals, 2073 birds, and 371 reptiles in the Zoological Gardens: and during the year 373 mammals, 1174 birds, and 470 reptiles were admitted, making a total for the year of 1106 mammals, 3247 birds, and 841 reptiles.

During 1914, 309 mammals, 867 birds, and 301 reptiles have died; that is, a percentage of 27·9 for mammals, 26·6 for birds, and 35·7 for reptiles. Out of the total deaths for the year, 1590 in all, 719 occurred in animals which had not been six months in the Gardens: that is, nearly half the total number. It has been found that after six months' residence in the Gardens, the death-rate falls rapidly; so it is assumed that by this time the new animals have got over their journeys, have died from any diseases they may have brought with them, or have got quite used to their new environment. Of these 719 animals, 141 were mammals, 375 were birds, and 203 were reptiles; and if these be deducted from their respective totals, the death-rate percentage will come out as 15·1 for mammals, 15·1 for birds, and 11·6 for reptiles.

The following Tables show the facts which have been ascertained in outline. Table I. summarizes the actual causes of death in the three groups specified. Under Reptiles are included Amphibia.

TABLE I.—Analysis of the Causes of Death.

Diseases.	Mammals.	Birds.	Reptiles.	Reference to Notes following.
<i>1. Microbic or Parasitic Diseases.</i>				
Tuberculosis	12	113	4	1
Mycosis	6	88	10	2
Pneumonia	53	118	69	3
Septicæmia	2	1	...	4
Abscess	4	...	1	5
Pericarditis	1	1	...	
Empyema	2	...	...
Peritonitis	6	...	...	6
Cholecystitis	1	...	...
Hydatids	1	...	...

TABLE I.—Analysis of the Causes of Death (*continued*).

Diseases.	Mammals.	Birds.	Reptiles.	Reference to Notes following.
1. <i>Microbic or Parasitic Diseases (cont.)</i>				
Toxoplasmosis	1	1	...	7
Piroplasmosis	1	...	...	8
Saccharomycosis .....	...	3	...	9
Gangrene	1	...	...
Necrosis	1	...	...
Sarcoptic Scabies	2	...	...
Demodectic Scabies	1	...	...	10
Filariosis .....	...	1	...	11
Worm Cysts .....	...	...	1	
2. <i>Diseases of Respiratory Organs.</i>				
Bronchitis	11	...	...	} 12
Broncho-pneumonia	24	...	...
Congestion of lungs	14	133	19	
3. <i>Diseases of the Heart.</i>				
Pericarditis .....	...	1	...	
Degeneration of heart-muscle ..	...	1	...	
4. <i>Diseases of the Liver.</i>				
Hepatitis	1	3	...	
Fatty degeneration	1	4	...	
Cirrhosis	3	...	...	13
5. <i>Diseases of the Alimentary Tract.</i>				
Gastritis	1	...	1	
Gastric ulceration	3	...	...
Gastro-enteritis	16	6	7	} 14
Enteritis	33	169	17	
Proctitis	1	...	...
Over-distension of stomach .....	...	1	...	
Gangrene of intestine	1	...	1	
Impacted feces	1	...	...
6. <i>Diseases of Urinary and Generative Organs.</i>				
Nephritis	66	129	4	15
Cystic kidneys .....	...	1	...	
Pyosalpinx	1	...	...
7. <i>Various.</i>				
Carcinoma	4	...	...	16
Sarcoma	3	5	...	17
Angioma	1	...	...
Rickets	1	...	...
Injuries discovered <i>post-mortem</i>	2	5	...	

Besides those tabulated above,

46 mammals, 96 birds, 13 reptiles, were killed by order or by companions,
 4 ,, 10 ,, 102 ,, died from malnutrition or starvation,
 8 ,, 42 ,, 67 ,, were too decomposed for examination.

In Table I. a classification is made of those diseases which were

the immediate causes of death, but in most cases the animals were suffering from other diseases as well. Table II. summarizes those other diseases from which the animals were suffering; and if this Table be taken in conjunction with Table I., a much more accurate estimate of the amount of disease in the Gardens will be arrived at.

TABLE II.—Other Diseases found in the animals tabulated in Table I.

Diseases.	Mammals.	Birds.	Reptiles.	Reference to Notes following.
Tuberculosis	2	15	1	
Mycosis .....	...	6	1	
Pneumonia	4	1	4	
Pericarditis	3	...	...
Peritonitis	3	...	1	
Abscess .....	...	...	1	
Empyema	1	...	...
Septicæmia	2	...	...
Plenritis	2	...	...
Malaria .....	...	15	...	18
Filaria	5	19	3	19
Hæmogregarines .....	...	...	19	20
Trypanosomes .....	...	2	1	21
Leucocytozoa .....	...	3	...	22
Sarcocystis	1	...	...
Pentastomes .....	...	...	2	
Hydatids	2	...	...
Worms	3	2	...	
<hr/>				
Bronchitis	11	...	...
Broncho-pneumonia	9	...	...
Congestion of lungs	23	125	3	
(Edema of lungs .....	...	80	...	
Collapsed lungs	2	...	...
Abscess of lung	1	...	...
Hydrothorax	1	...	...
Pericarditis .....	...	11	1	
Fatty heart	3	7	...	
Atheroma	3	29	...	23
Aneurism .....	...	1	...	
Hepatitis	1	6	1	
Fatty liver	27	80	14	
Cirrhosis of liver	1	2	...	
Gall-stones	2	1	...	
Gastritis	1	...	...
Gastric ulceration	13	...	...
Dilated stomach	1	1	...	
Gastro-enteritis	2	...	2	
Enteritis	23	113	8	
Intussusception	1	...	...
Intestinal obstruction	1	...	...
Nephritis	58	111	6	
Stone in kidney	2	...	...	24
Inflamed oviduct .....	...	1	...	
Prolapsus ani .....	...	...	2	
Sarcoma .....	...	1	2	
Ascites .....	...	4	1	
Rickets	12	2	1	25
Injuries	2	9	...	

Table III. shows, in still further detail, the distribution of diseases amongst the various orders of mammals.

TABLE III.—The Distribution of Diseases causing Death amongst the principal Orders of Mammals.

Diseases.	Primates.	Carnivora.	Rodentia.	Ungulata.	Edentata & Insectivora.	Marsupialia.
Tuberculosis	4	2	2	2	...	2
Mycosis .....	...	...	...	2	...	4
Pneumonia	8	10	16	3	10	6
Abscess .....	...	2	...	2	...	...
Toxoplasmosis .....	...	1	...	...	...	...
Piroplasmosis .....	...	1	...	...	...	...
Empyema .....	...	1	1	...	...	...
Pericarditis .....	...	...	...	1	...	...
Cholecystitis .....	...	...	...	...	...	1
Sarcoptic Scabies .....	...	...	...	2	...	...
Demodetic Scabies	1	...	...	...	...	...
Gangrene .....	...	...	...	1	...	...
Neerosis .....	...	...	...	1	...	...
Septicæmia .....	...	...	2	...	...	...
Peritonitis	1	1	...	2	...	2
Hydatids	1	...	...	...	...	...
Bronchitis	3	2	3	2	1	...
Broncho-pneumonia	7	2	4	2	3	6
Congestion of lungs	4	1	3	1	5	...
Cirrhosis of liver	1	2	...	...	...	...
Fatty liver .....	...	...	...	...	...	1
Hepatitis .....	...	1	...	...	...	...
Gastritis .....	...	...	...	...	1	...
Gastric ulceration	1	2	...	...	...	...
Gastro-enteritis	1	11	1	1	2	...
Enteritis	11	6	7	7	...	2
Impacted fæces	1	...	...	...	...	...
Proctitis	1	...	...	...	...	...
Gangrene of intestine .....	...	1	...	...	...	...
Nephritis	7	24	10	14	2	9
Pyosalpinx .....	...	1	...	...	...	...
Carcinoma .....	...	2	2	...	...	...
Sarcoma	1	1	...	1	...	...
Angioma .....	...	1	...	...	...	...
Rickets .....	...	...	1	...	...	...
Injuries	1	...	...	1	...	...

Notes on the foregoing Tables.

1. The total incidence of infectious diseases in the Gardens is about 8·5 per cent. for mammals, and 10 per cent. for birds and reptiles.

2. The following are the percentages of deaths from tubercle during the year: mammals ·9 per cent., birds 3·5 per cent., and reptiles ·5 per cent. on the total numbers for the year. The

mammals have reached the lowest figure during the last seven years: of the 12 cases, 3 were pet animals, and 2 came from a suspected source. Two had been kept for about five years in the open, both summer and winter. The birds show a slight increase, and in 63 of the cases the infection was general. About 50 of the birds came from the Small Bird House, where there was an epidemic during the spring and summer months. In three of the birds it was of bovine type, and in a Coati it was of "perlsucht" type.

3. All the mould diseases have been grouped under Mycosis. Of the 6 mammals, 4 were Kangaroos and 2 Gazelles. The number of deaths from mycosis in birds is still very high, and constitutes close on 10 per cent. of the deaths. It has increased in reptiles, and has been found in the larger frogs and tortoises. It is produced in them by a much larger mould than that found in the mammals and birds, which generally leads to the formation of tumours.

4. There has been a considerable increase in the incidence of pneumonia in mammals and birds, but a considerable decrease in reptiles, due to the careful sterilization of the cages with steam. In three of the reptiles it was due to worms, the rest were pneumococcal.

5. In three of the mammals the abscesses, which were large and excavating, had started in connection with the teeth: in the remaining mammal the abscess was in the mediastinal glands, and was due to nematode worms.

6. Due in a Seal to perforation of stomach which contained $4\frac{1}{2}$ lbs. of stones, and in two Tasmanian Wolves to perforation of the intestine, caused by a mycotic growth in the intestine.

7. Found in a Fossa from Madagascar, and in a Fruit-Pigeon from the Aru Islands, in both for the first time.

8. Found in an Indian Wild Dog, which fortunately was only three weeks in the Gardens.

9. This *Saccharomyces* was of the *Oidium albicans* type.

10. An acute infection in a Barbary Ape, with *Demodex folliculorum*, producing extensive ulceration of the face.

11. The designation is not used here in its usual sense. In this case the liver of a Honey-eater was riddled with nematode worms, but no embryos were found in the blood.

12. There has been a slight general increase in diseases of the respiratory organs: these are largely dependent on weather.

13. Two of these cases were in Cats, and one in a Chimpanzee, whose gall-bladder was full of gall-stones.

14. In 3 of the mammals, 10 of the birds, and 2 of the reptiles the inflammation was caused by parasites or foreign bodies. In 87 of the birds it was hæmorrhagic and of bacterial origin. The remainder of the cases were apparently due to the quantity or quality of the food not being suitable to the animal.

15. There has been a general decrease in the number of cases of nephritis. 18 of the cases in mammals and 13 of those in

birds were acute. The great majority of the cases were of varying degrees of chronicity and were associated with other old-age changes.

16. These cases of cancer occurred as follows:—epithelioma of neck in a Wolf and in a Gerbille; cancer of liver and glands in a Bear, and of pancreas in a Marmot.

17. Of the sarcomata, one was in the testis of an old Dingo, another, an angiosarcoma, in the liver of a Barbary Sheep, and the third, an adeno-sarcoma, in the kidney of an Ouakari.

18. Under the term malaria are grouped 12 cases due to *Hæmoproteus danilewskyi* and 3 due to *Plasmodium præcox*: see section on blood-parasites below.

19, 20, 21, 22. See the section on blood-parasites below.

23. The number of cases of atheroma indicates that a large number of old birds have died.

24. One case in an Otter, the other in a Wallaby. Both were uric acid calculi.

25. The number of rickety animals in the Gardens has greatly decreased.

BLOOD-PARASITES.

During the year the blood of every animal which died has been examined, with the result that parasites have been found in 70; in 30 species for the first time.

They have been distributed as follows:—

Filarieæ. In 5 mammals; in 3 species for the first time.

19 birds; in 6 species for the first time.

3 reptiles; in 3 species for the first time.

Trypanosomes. In 2 birds; in both for the first time.

1 reptile.

Malaria. { *Hæmoproteus danilewskyi*. In 12 birds; in 8 species
for the first time.
Plasmodium præcox. In 3 birds; in all for the
first time.

Leucocytozoa. In 3 birds; in 2 species for the first time.

Toroplasma. In 1 mammal and 1 bird; in both for the first time.

Babesia. In 1 mammal.

Hæmogregarines. In 19 reptiles; in 3 species for the first time.

The following Tables show the occurrence of the blood-parasites in detail:—

Embryo Filarieæ found in the blood of Mammals.

	HABITAT.	TYPE.
<i>Found in the following for the first time:</i>		
2 Squirrel Monkeys (<i>Saimiris sciurea</i>)...	Brazil.	Long, thin.
2 Canadian Porcupines (<i>Erithizon dorsatus</i>).	N. America.	Long, pointed.
Marmoset (<i>Leontocelus mystax</i>)	S. America.	Long.

Embryo Filarie found in the blood of Birds.

	HABITAT.	TYPE.
White-throated Jay Thrush (<i>Garrulus albigularis</i>).	India.	
Himalayan Whistling Thrush (<i>Myiophoneus temmincki</i>).	India.	
Brazilian Hangnest (<i>Icterus jamaicae</i>)...	Colombia.	
2 Chilian Starlings (<i>Cuculus aterrimus</i>).	Chili.	
Green Cardinal (<i>Gubernatrix cristatella</i>).	S. America.	
2 Blue Birds (<i>Sialia sialis</i>)	N. America.	
King Bird of Paradise (<i>Cicinnurus regius</i>).	Aru Islands.	Two kinds found; one very long, the other short, thick, pointed.
Occipital Blue Pie (<i>Urocissa occipitalis</i>).	India.	
Hermit-Thrush (<i>Hylocichla guttata</i>) ...	N. America.	

Found in the following for the first time :

White-bellied Guan (<i>Ortalis albiventris</i>).	Brazil.	Short, thick, pointed.
3 Black-headed Partridges (<i>Caccabis melanocephala</i>).	Arabia.	Long, pointed, encapsuled.
Shining Weaver-Bird (<i>Hypocheris nitens</i>).	W. Africa.	Short, thick, pointed.
Double-banded Finch (<i>Stictoptera annulosa</i>).	Australia.	Long.
Cuban Mocking-Bird (<i>Mimus orpheus</i>) .	Cuba.	Long, striated, encapsuled.
Blue-headed Rock Thrush (<i>Petrophila cinclorhynchus</i>).	India.	Thick, short.

Embryo Filarie found in the blood of Reptiles : in all for the first time.

Bull Frog (<i>Rana catesbiana</i>).....	N. America.	Short, encapsuled.
Chicken Snake (<i>Coluber obsoletus</i>)	N. America.	Long, encapsuled.
Boa (<i>Boa constrictor</i>)	S. America.	Long.

Trypanosomes found in the blood of Birds : in both for the first time.

King Bird of Paradise (<i>Cicinnurus regius</i>).	Aru Islands.	Of the type of <i>T. avium</i> .
Blue-eyed Raven (<i>Macrocorax fuscicapillus</i>).	Aru Islands.	

Trypanosomes found in the blood of Reptiles.

Ball Frog (<i>Rana catesbiana</i>).....	N. America.	Of the type of <i>T. rotatorium</i> .
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Hemogregarines found in the blood of Reptiles.

Diamond Rattlesnake (<i>Crotalus atrox</i>) .	Texas.
2 American Black Snakes (<i>Zamenis constrictor</i>).	N. America.
Hog-nosed Snake (<i>Heterodon platyrhinos</i>).	N. America.
Mexican Snake (<i>Coluber melanoleucus</i>) .	Mexico.
2 Pigmy Rattlesnakes (<i>Sistrurus miliarius</i>).	N. America.

	HABITAT.	TYPE.
Russell's Viper (<i>Vipera russelli</i>)	India.	
Dark Green Snake (<i>Zamenis gemonensis</i>)	Europe.	
Indian Rat-Snake (<i>Zamenis mucosus</i>) ...	India.	
Boa (<i>Boa constrictor</i>)	S. America.	
Chicken Snake (<i>Coluber obsoletus</i>)	N. America.	
Say's Snake (<i>Coluber melanoleucus</i>).....	N. America.	
Testaceous Snake (<i>Zamenis flagelliformis</i>).	N. America.	
Corais Snake (<i>Coluber corais</i>)	Brazil.	
Bull Frog (<i>Rana catesbiana</i>)	N. America.	
Green Tree-Snake (<i>Dendraspis viridis</i>) .	W. Africa.	

Found in the following for the first time :

Emperor Boa (<i>Boa imperator</i>)	C. America.	Very large.
Long-necked Terrapin (<i>Chelodina expansa</i>).	Queensland.	Stout, short.

Hæmoproteus danilewskyi found in the blood of Birds.

	HABITAT.
2 Blue-crowned Hanging Parakeets (<i>Loriculus galgulus</i>)	Malay.

Found in the following for the first time :

2 Seed-eaters (<i>Criethagra chrysopyga</i>)	W. Africa.
Java Sparrow (<i>Padda oryzivora</i>)	Java.
Cotton Teal (<i>Nettopus coromandelianus</i>).....	India.
Violet-necked Lory (<i>Eos riciniata</i>)	Aru Islands.
3 Black-headed Partridges (<i>Caccabis melanocephala</i>)	Arabia.
Orange-bellied Fruit Pigeon (<i>Ptilinopus iozonus</i>).....	Aru Islands.
Yellow-tufted Honey-eater (<i>Ptilotis auricomis</i>).....	N.S. Wales.

Plasmodium præcox found in the blood of Birds : in all for the first time.

Quail Finch (<i>Ortygospiza polyzona</i>)	S. Africa.
Falcated Duck (<i>Ennetta falcata</i>)	Siberia.
Grey-winged Onzel (<i>Merula boulboul</i>).....	India.

Leucocytozoa found in the blood of Birds.

Owl (<i>Syrnium aluco</i>)	Europe.
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Found in the following for the first time :

Falcated Duck (<i>Ennetta falcata</i>)	Siberia.
Chilian Starling (<i>Curæus aterrimus</i>)	Chili.

Babesia found in the blood of the following Mammal.

Indian Wild Dog (<i>Cyon dukhunensis</i>)	India.
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Toxoplasma found in the blood of the following for the first time.

Fossa (<i>Cryptoprocta ferox</i>)	Madagascar.
Blue-tailed Fruit Pigeon (<i>Carpophaga concinna</i>)	Aru Islands.